Mr. Alpert’s Advanced Physics

Hooke’s Law Mini-Lab

Mr. Alpert’s Hooke’s Law Lab: Ut Tensio Sic Vis

Hooke’s Law is based on the belief*…” that when matter is deformed (compressed, twisted, stretched, etc.) and the deforming forces are sufficiently small, the material will return to its original shape when the deforming forces are removed.”*

Different objects stretch different amounts according to their structure and stiffness.  
The amount of stretchiness is measured by a constant, called, “the spring constant.” It is designated by the letter, “k.”

*Hooke’s Law is expressed in the simple formula: F = -kx where F is the force applied in Newtons, k is the spring constant and x is the deformation of the spring.*

You will be measuring the spring constant of two different springs by applying weights to them and measuring the deformation in cm. After you have completed the measurements, you are to graph weight (force) over distance using Excel. Once you have created the graph, you are to use Excel to find the “line of best fit” and then the regression formula for that line. The formula should be in the form of y = mx + b where “m” is the spring constant.

1. You will be given one spring with known lengths and known masses. The designation of each spring will be put on the board and should be recorded in your own version of the data table which is found in the Southern Methodist University lab handout.
2. You are to hang a spring from a ring stand.
3. You are to hang a series of weights from each spring and measure the deformation or stretching that results from each weight. You must adapt your procedure to your own spring.
4. You are to complete a data table for this spring with at least four data points (different weights).
5. All weights are to be recorded in Newtons.
6. As noted in the handout, you are to use Excel to graph the length of the deformation (Delta X or ∆x) for each weight.
7. Once you have completed the graph, ask Excel to find the “line of best fit.”
8. Be sure to choose a linear line of best fit.
9. You may then ask Excel to find the formula that created this line, it is called a “regression formula.” It should be in the form of a straight line according to y = mx +b. Your value of “m” will be the Spring Constant.
10. Since we have two springs of each type, you should check your answer against another group that tested the same spring.
11. You are to write up the lab as follows without background as it was supplied in the SMU lab. NOTE: you are responsible for the information contained in this background on any test on this concept.
12. Purpose (you decide)
13. Materials
14. Variables: independent, dependent and controlled
15. Procedure (passive voice)
16. Hypothesis***: If a force is applied to a spring, then it will stretch in direct proportion to the that force***
17. Data Table
18. Graph
19. Calculation of the Spring Constant
20. Conclusion including sources of error and whether the hypothesis was proven

You may use the following data table or develop your own:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Spring description | Force applied (grams) | Force applied (Newtons) | Initial length of spring | Extended length of spring | Delta X |
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